

INSERTION APPARATUS FOR ATTACHING SLIDERS
ONTO ZIPPER BAGS AND FILM

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FIELD OF THE INVENTION

The present invention relates to reclosable plastic bags having slide zippers and, more particularly, to a slider, a slider insertion apparatus, a method for 10 inserting the slider on an interlocked zipper, and a device for positioning the inserted and straddling slider on the interlocked zipper.

DESCRIPTION OF THE PRIOR ART

15 Reclosable bags having slide zippers are generally more desirable to consumers than bags which have traditional interlocking zippers, since such bags are perceived to be easier to open and close than slider-less zippers. As a result, slide zippers for use with plastic 20 bags are numerous and well known in the reclosable fastener art. Typical slide zippers comprise a plastic zipper having two interlocking profiles and a slider for engaging and disengaging the interlocking profiles of the zipper. The slider straddles the zipper and has a 25 separator at one end which inserts between the profiles to force them apart; that is, the separator plows between the interlocking members of the profiles forcing them to disengage and open the zipper. The other end of the slider is sufficiently narrow to be able to close the 30 zipper by forcing the interlocking members of the profiles to re-engage. Examples of conventional slide zippers can be found in U.S. Patent Nos. 3,426,396; 3,713,923; 5,007,143; 5,088,971; 5,131,121 and 5,664,299.

Methods and apparatuses for manufacturing reclosable plastic bags using reclosable zippers with a slider are also well known in the art. Known slider loaders include the Hugues reference (U.K. Patent No. 2,085,519) and the 5 LaGuerve references (U.S. Patent Nos. 3,701,191 and 3,701,192). Use of these prior art apparatuses is limited by requiring a separation of the interlocked members of profiles prior to the insertion of a slider. By requiring this separation of the interlocked members, slider 10 insertion in manufacturing reclosable bags requires an extra step as well as a potential for machine breakdown associated with this extra step.

An improved slider for zipper assemblies has been developed in Machacek et al (U.S. Patent No. 6,047,450). 15 The slider of the Machacek patent includes features that facilitate the insertion of a slider onto the zipper of a reclosable bag. Most importantly, the Machacek patent allows the slider to be inserted over a closed zipper without the requirement of first separating the 20 interlocking members of the zipper.

Despite the advantages of the Machacek patent, technical advances allow further improvement to the slider described in Machacek. An improvement would allow the slider to be inserted with the zipper fully secured 25 in the slider, so that during an opening of the reclosable bag the interlocking members of the profiles of the zipper would not unintentionally re-engage within the slider.

For example, a re-engagement of the interlocking 30 members could occur when the zipper opening end of the slider is pushed toward a closed zipper park position. Such a re-engagement can occur during operation of the zipper or if the slider is inserted too far from an end

stomp of the zipper. By reducing the possibility of unintentional re-engagement of the interlocking members of the profiles, production of defective bags is reduced.

Since the Machacek patent eliminates the requirement 5 of separating the interlocking members of the zipper of a reclosable bag prior to insertion of a slider, this eliminated requirement permits the use of a smaller sized slider insertion apparatus. The slider insertion apparatus would also have the advantage of bringing the 10 entry of stored sliders as close as possible to an inserting position, with the result of minimizing manufacturing time or maintenance requirements.

Once the slider is inserted on the interlocking members of the zipper, a relatively simple and effective 15 pneumatic device for positioning the straddling slider to open or to close the reclosable bag is also desirable. Along with the portability of pneumatic sources, a pneumatic positioner would have the advantage of being able to be used at various points in the bag 20 manufacturing process. In a vertical form-fill-and-seal machine, the positioner could assist in movement of the reclosable bag within the machine.

SUMMARY OF THE INVENTION

25 Accordingly, the present invention provides an improved slider for securing interlocking members of the zipper and a slider insertion apparatus. The slider insertion apparatus includes an activator with pusher, an insertion cylinder, and a zipper guide. The zipper guide 30 and the activator with pusher are manufactured to facilitate movement of the zipper within the slider insertion apparatus; to properly position the profiles of the zipper for slider insertion; and to secure the zipper

when the slider is inserted onto the zipper. A loading rack with a supply of sliders may be part of the slider insertion apparatus, with the loading rack being a mechanically attachable device.

5 In the slider insertion process, a fastener or a zipper with its profiles interlocked by their interlocking members is guided between opposing male and female guide plates of the zipper guide. The zipper is further guided to an insertion point under the activator 10 with pusher. The activating fork of the activator with pusher secures and offsets the interlocking members to accommodate a slider. The slider is inserted onto the interlocked zipper by the pusher area of the activator with pusher.

15 After insertion of the slider onto the zipper of the reclosable bag, a positioner fluidly attached to a pneumatic supply may be used for positioning the straddling slider on the zipper. When the positioner is used in conjunction with the driving rollers of a 20 vertical form-fill-and-seal (VFFS) machine, the positioner assists in moving the zippered film within the machine.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Thus by the present invention its objects and advantages will become readily apparent upon reading the following detailed description in conjunction with the accompanying drawings, in which:

30 Figure 1 is a perspective view depicting a slider of the present invention;

Figure 2 is an end view of the zipper opening end of the slider with the slider shown encompassing a zipper;

Figure 3 is an end view of the zipper closing end of the slider with the slider shown encompassing a zipper;

Figure 4 is a perspective view depicting the slider on a reclosable plastic bag;

5 Figure 5 is a side view depicting a slider insertion apparatus of the present invention using a horizontal slider loading rack;

Figure 6 is a side view depicting the slider insertion apparatus using a curved slider loading rack;

10 Figure 7 is a sectional view depicting an activator with pusher taken from reference line 7-7 of Figures 5 and 6 and an interlocked zipper positioned prior to activation;

Figure 8 is a sectional view depicting the activator with pusher taken from reference line 8-8 of Figures 5 and 6 and depicting an interlocked zipper activated prior to a slider insertion;

Figure 9 is a sectional view of the activator with pusher of the present invention;

20 Figure 10 is a side view of the male guide plate of the zipper guide of the present invention;

Figure 11 is a side view of the female guide plate of the zipper guide;

25 Figure 12 is an end view of the attachment piece of the zipper guide;

Figure 13 is a side view of the zipper guide with an extended male guide plate, an extended female guide plate and the attachment pieces shown assembled;

30 Figure 14A is a side view of the pneumatic positioner of the present invention; and

Figure 14B is a sectional view of the pneumatic positioner taken from reference line 14B-14B of Figure 14A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail wherein like numerals indicate like elements throughout the several views, Figure 1 is a perspective view of an improved slider 10 of the present invention. As shown in the figure, the slider 10 includes a zipper opening end 12 and a zipper closing end 14.

The slider 10 further includes a keeper 15 extending from a top plane 16 of the slider 10 between arms 17 and 18 toward longitudinally extending retaining shoulders 19 and 20. The retaining shoulders 19 and 20 are shown as discontinuous; however, the shoulders may be continuous along the length of the slider 10. The keeper 15 as well as the retaining shoulders 19 and 20 secure a zipper within the slider 10, as shown in Figure 2.

Figure 2 is an end view of the opening end of the slider 10 with the slider shown encompassing a zipper 25 of a type known to those skilled in the art. As shown in the figure, the keeper 15 secures an interlocking member 22 of profile 24 of zipper 25 by preventing the interlocking member 22 from moving toward the mating interlocking member 26 of profile 28. If the interlocking members are formed of a sufficiently stiff material, the interlocking member 22 may include a slight recess to accommodate the keeper. By preventing movement of the interlocking member 22 towards the interlocking member 26, the profiles 24 and 28 always remain partially disengaged at the opening end, thereby reducing the possibility of an unintentional full engagement of the interlocking members within the slider.

Figure 4 is a perspective view of the slider 10 and zipper 25 as part of a reclosable bag 44. In the figure,

the zipper 25 is disposed across the transverse top edges 42 and 43 of the front and rear walls of reclosable bag 44. In use, the straddling slider 10 is slidable along the zipper in a closing direction "A" in which the 5 interlocking members 22 and 26 are forced to be fully engaged by the slider. When the slider 10 is moved in an opening direction "B", the interlocking members are disengaged by pinching the arms 17 and 18 at the zipper opening end 12 of the slider 10.

10 Figure 5 is a side view depicting the slider insertion apparatus 50 of the present invention. The slider insertion apparatus generally includes an activator with pusher 52, an insertion cylinder 54, and a zipper guide 56. The specially shaped elements of the 15 activator with pusher 52 and the zipper guide 56 will be further discussed in relation to the detailed figures below. A loading rack 58 may be part of the slider insertion apparatus 50 or may be mechanically attached to the slider insertion apparatus. In Figure 5, the loading 20 rack 58 is a horizontal magazine-type rack supplying individual sliders 10 at an entry point 60.

During an insertion, in slider insertion area 62, an activating fork 64 of the activator with pusher 52 vertically offsets the interlocking members 22 and 26 of 25 the zipper 25 by moving in direction "C". This activation of the zipper 25 is in close proximity to the zipper opening end 12 of the slider 10 to be inserted. A zipper guide 56 holds the zipper 25 closed at the zipper closing end 14 of the slider 10 to be inserted. Coinciding with 30 the movement of the activating fork 64 in direction "C", a pusher 65 of the activator with pusher 52 inserts the slider 10.

The activator with pusher 52 is driven in direction "C" with a force emitted from the insertion cylinder 54. The insertion cylinder 54 is preferably pneumatically driven for effective slider insertion speed either with a 5 single cylinder or separate cylinders for the activator and pusher.

After insertion of the slider 10 onto the zipper 25, the activator with pusher 52 retracts in direction "D". This retraction movement allows the loading rack 58 to 10 pneumatically deliver another slider 10 to the slider insertion apparatus 50 at the entry point 60. The slider 10 may be delivered pneumatically or a mechanical pawl 66 may also be used on the loading rack 58 for moving the slider 10 to the slider insertion apparatus. The 15 mechanical pawl 66 is typically used if the insertion rate requirements must be in excess of a few per minute.

The zipper guide 56 then guides a next zipper length by the profiles 24 and 28 in direction "E" into the slider insertion apparatus 50. As the zipper 25 enters 20 and advances through the zipper guide 56, the confined opening of the zipper guide will prevent the zipper from opening or rolling from side to side, contributing to a stable insertion of the next slider 10.

Figure 6 depicts the slider insertion apparatus 50 of the present invention with a curved loading rack 72. 25 Using the curved loading rack 72 may have advantages over a horizontal loading rack in terms of space consideration, as well as the assistance of gravity in feeding sliders 10 to the slider insertion apparatus 50.

30 Figure 7 depicts the interlocking members 22 and 26 in an interlocked or fully engaged position prior to activation. As shown in Figure 8, the activator with pusher 52 moves in direction "C" to offset the

interlocking members 22 and 26 at the zipper opening end 12 of the slider 10 to be inserted. In the offsetting or activating action, the interlocking members are partially disengaged but are not separated. When the interlocking 5 members 22 and 26 are offset in relation to each other, the keeper 15 can properly secure the interlocking member 22. See Figure 2.

Figure 9 is a sectional view of the activator with pusher 52. As shown in the figure, the activator with 10 pusher 52 includes the activating fork 64 formed by the fins 86 and 88. From a lower end 90, the inner surfaces of the lower portions 87, 91 of the fins 86 and 88 chamfer towards a vertical plane 89 between the fins. The chamfer of the fin facilitates movement of the zipper 15 guide 56 within the slider insertion apparatus 50. The upper portion 93 of fin 86 further tapers toward the vertical plane 89 and the upper portion 95 of the opposite fin 88 tapers parallel to the upper portion 93 of the fin 86, so that a clearance 92 is formed. The 20 shape of clearance 92 positions the interlocking members 22 and 26 of the zipper for proper placement within the slider 10, particularly allowing the interlocking member 22 to be secured by the keeper 15 (as shown in Figure 2).

Shown respectively in Figures 10 and 11, the male 25 guide plate 81 and the female guide plate 82 comprise the guiding portion of the zipper guide 56. At a zipper entering end 110 of the male guide plate 81 of Figure 10, each of the corners 112 and 114 is shaped with a radius to prevent snagging or slitting of the profiles 24 and 28 30 entering the slider insertion apparatus 50. At a zipper exiting end 116, a top corner 118 has a radius and a bottom corner 120 is chamfered. Similar to the formed radii at the zipper entering end 110, the shapes of the

corners 118 and 120 minimize slitting or snagging of the profiles 24 and 28 during movement of the reclosable bag 44 within the zipper guide 56. If space permits, the length of the zipper guide 56 can be extended at the 5 exiting end 116 of the male guide plate 81. See Figure 13 for a detailed view of an extended male guide plate.

In Figure 10, the male guide plate 81 forms a notch 122 away from the zipper exiting end 116 in order to accommodate the slider 10 after slider insertion. Toward 10 the zipper entering end 110, the male guide plate 100 extends from the notch 122 for a protrusion 123. The protrusion 123 functions to maintain the stability of the zipper 25 and to offset the interlocking members 22 and 26 when the activator with pusher 52 activates the zipper 15 25. Two apertures 124 and 126 are provided to accommodate fasteners (not shown) which mechanically attach the male * guide plate 81 to an attachment piece 130.

The female guide plate 82 of the zipper guide 56 is shown in Figure 11. In the figure, the female guide plate 20 82 has a zipper entering end 140, with each corner 142 and 144 of the zipper entering end shaped with a radius. The radial shape of the corners 142 and 144 prevents snagging and slitting of the profiles 24 and 28 as the profiles enter the slider insertion apparatus 50. At a 25 zipper exiting end 146, a top corner 148 has a radius and a chamfered bottom corner 150. Similar to the formed radii at the zipper entering end 140, the shape of the corners 148 and 150 minimizes slitting or snagging of the profiles 24 and 28 during movement of the reclosable bag 30 44 within the slider insertion apparatus 50. Also similar to the extension of the male guide plate 81, the length of the zipper guide 56 can be extended at the zipper

existing end 146. See Figure 13 for a detailed view of an extended female guide plate.

In Figure 11, the female guide plate 82 is formed with a notch 152 to accommodate the activation fork 64 during zipper activation. A slope section 153 allows a zipper 25 with a straddling slider 10 to move up and away from the notch to protrusion 154 as the zipper is pulled away from the slider insertion apparatus 50. Two apertures 155 and 156 are provided and sized to 10 accommodate fasteners (not shown) which mechanically attach the female guide plate 82 to the attachment piece 130.

Figure 12 is a detailed view of the attachment piece 130 used for the male guide plate 81. Another attachment 15 piece 130 is provided for attachment of the female guide plate 82 in the same fashion.

As shown in Figure 12, a faceplate 170 is provided for attachment of the male plate 81. The attachment piece 130 is formed as an angle bracket to strongly secure to 20 the slider insertion apparatus 50 while allowing flexibility of the zipper guide 56. The attachment piece 130 includes a notch 171 sized to allow passage of the engaged zipper 25 (shown in phantom lines for purposes of illustration) to the slider insertion area 62. Apertures 25 172 are provided for securing fasteners (not shown) which attach the attachment piece 130 to the slider insertion apparatus 50.

Figure 13 depicts an extended male guide plate 81, an extended female guide plate 82 and the attachment 30 pieces 130 assembled to form the zipper guide 56. The extension of the male guide plate 81 provides for another protrusion 174 tapering away from the notch 122 and toward the zipper exiting end 116. Increasing the length

of the male guide plate 81 provides added support for the profiles 24 and 28 and further straightens any misalignment which may occur during slider insertion.

The extension of the female guide plate 82 includes 5 another notch 176 tapering down from the protrusion 154 and opposing the protrusion 174 of the male guide plate 81. The notch 176 minimizes interference with the zipper 25 and allows the slider to transition away smoothly without fluctuations when the zipper 25 is pulled through 10 the slider insertion apparatus 50 in direction "E".

The male guide plate 81 and the female guide plate 82 assemble to their respective attachment pieces 130 with fasteners through the apertures of each plate and piece. By attaching the guide plates 81 and 82 to the 15 slider insertion apparatus 50 by way of the attachment pieces 130, the guide plates can be rigidly mounted and can resist misalignment forces produced during slider insertion.

Figures 14A and 14B depict a pneumatic positioner 20 200 that may be used in conjunction with a vertical form, fill and seal (VFFS) bag making machine or an alternative automated process for producing reclosable bags. The pneumatic positioner 200 would typically be used after 25 the slider 10 has been inserted onto the zipper 25 of the reclosable bag 44.

As shown in Figure 14A, the reclosable bag 44 enters a channel-shaped guide 210. At the upper end 212 of the guide 210, a pneumatic source 214 blows pressurized air into the guide. With a clearance 216 sized to snugly 30 accommodate the reclosable bag 44, the force of the pressurized air focuses on pushing against the slider 10, thereby assisting belt drives 217 of the VFFS machine

when moving the reclosable bag 44 through the guide 210 in direction "F".

Alternatively, if the force of the pressurized air exceeds the drag force of the slider 10 on the zipper 25, 5 the relative motion between the slider and the zipper will move the slider 10 against the end stop 218, thereby placing the zipper in a fully opened or a fully closed position. If pressurized air is still applied, the force of the pressurized air acts against the slider 10 on the 10 end stop 218, thereby moving the reclosable bag 44 down the guide 210 in direction "F". On horizontal bag-making machines or other bag-making machines known to those skilled in the art, the pneumatic positioner 200 could be used for opening or closing the zipper 25.

15 The foregoing description of the preferred embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive nor to limit the invention to the precise form disclosed; and obviously many 20 modifications and variations are possible in light of the above teaching. Such modifications and variations that may be apparent to a person skilled in the art are intended to be included within the scope of this invention as defined by the accompanying claims.